In planning long flights an accurate forecast is needed. On January 2 the plane left Charleston, S. C., for Rockaway Beach, N. Y., a distance of a little over 600 miles. At first it was doubtful if the trip could be made in a single hop, for an active LOW was just passing into the North Atlantic and northwest winds existed from the Great Lakes to the Atlantic coast, with west winds following. After a careful study of the map, Commander Read was told that although northwest winds would exist at Charleston on the morning of the 2d, the *NC-4* would run out of them into fairly strong westerly winds by the time Hatteras was reached and would continue in them the rest of the journey. Under these conditions Rockaway Beach could be reached by evening. The trip was thus planned and the above conditions found. Charleston was left at 7:50 a. m. and Rockaway reached at 5:36 p. m., or 9 hours 46 minutes later. (This was about 25 minutes longer than the time it took the *NC-4* to fly from Ponta Delgada, Azores, to Lisbon, Portugal.) Because of the strength of the wind the average height of the plane during this flight was about 60 feet. From the start to the finish the air was extremely rough, so rough in fact that all members of the crew agreed that it was the worst air they had ever experienced. Following this flight a discussion arose concerning "head winds" and suggested to me the following remarks about the effects of cross winds upon the flight of the plane. A wind 90° to the line of flight, such as a west wind when the plane is flying to a point directly north of it, becomes more and more a head wind as it increases in velocity. It seems as if this should be perfectly evident since the plane must head into the wind, to a certain extent, to overcome the drift, yet it has been noticed that sometimes even those who have had considerable experience in aircraft forget this fact and will maintain that such a wind neither aids nor retards the plane.

NOTES, ABSTRACTS, AND REVIEWS.

NUMBER AND NATIONALITIES OF VESSELS MAKING WEATHER REPORTS TO THE UNITED STATES WEATHER BUREAU.

The following table gives the number of vessels of different nationalities on the Weather Bureau list, October 7, 1920, and the increase or decrease in number and percentage since October 8, 1919.

The decrease noticed in a few cases is due to the fact that the list was gone over thoroughly a short time ago and a number of vessels were taken off that did not appear in Lloyds Register or the Maritime Register, and were evidently out of commission. On the present list there are quite a few vessels that have not been heard from in the last two or three years; they are still in active service, however, and efforts are being made through the different marine centers to persuade their masters to resume the work. These efforts are meeting with considerable success, as shown by the number of old observers who are again sending in reports after a protracted period of inactivity.

Nationality of vessel.	Number on Oct. 7, 1920.	Increase or decrease since Oct. 8, 1919.	Percentage of increase or decrease.
United States Government	109		
United States Shipping Board	405		
All other American	478		
Total American	992	404	68
British	536	10	2
Dutch	152	25	20
Japanese	131	[1] 2	[1] 2
French	73	10	16
Italian	73	18	33
Norwegian	42	2	5
Danish	38	[1] 5	[1] 12
Spanish	36	11	44
Belgian	31	12	63
Swedish	15	4	36
Russian and Finnish	6	[1] 2	[1] 25
Honduran	4	0	0
Chilian	3	2	200
Argentinian	2	1	100
Brazilian	2	0	0
Chinese	2	[1] 2	[1] 50
Interallied	2	1	100
Portuguese	2	0	0
Cuban	1	1	
German	1	1	
Greek	1	1	
Icelandic	[2] 1	1	
Mexican	1	1	
Peruvian	1	1	
Total	2,148	495	30

[1] Decrease. [2] Formerly under Danish flag.

—*F. A. Young.*

DISTRIBUTION OF WEATHER FORECASTS, WARNINGS AND INFORMATION BY RADIO.

In a recent circular (Oct. 26, 1920), the Forecast Division of the Weather Bureau has announced an enlarged plan for the dissemination of weather information, weather forecasts, warnings, and advices to shipping, which has been in actual operation for a number of years, by the office of communications of the Navy Department.

Following is a list of the distributing stations, with their present wave lengths and time of sending:

Station.	Wave length.	Sending time (75th meridian time).
Arlington, Va.	2,500 meters	Shortly after 10 p. m.
Key West, Fla.	1,500 meters	Shortly after 10 p. m.
Point Isabel, Tex.	2,350 meters	Midnight.
Great Lakes, Ill.	1,500 meters	Shortly after 10 p. m. (Apr. 15-Dec. 20).
San Juan, P. R.	600 meters, damped, followed by 5,250 meters con. wave.	9 p. m. (June to Nov., inclusive).

Each station sends out approximately the same character of bulletins, which are based upon the regular 8 p. m., 75th meridian time, Weather Bureau observation, but vary slightly to conform to the needs of the different sections to be informed. The bulletins are in two parts, the first consisting of the actual weather conditions at certain stations and being in code. The second part is in plain language and is a forecast giving the wind and weather conditions, and whatever information deemed necessary as to storm centers, storm and hurricane warnings.

EXAMPLE OF BULLETIN.

(First part:) USWB J 01662, S 00663, FP 98821, ML 95427, T 95846, NY 93258, DB 92888, LB 95612, CH *94216, AV 98282, C 96682, B 00661, etc.*

(Second part:) Winds off Atlantic coast north of Sandy Hook will be shifting gales with rain. Sandy Hook to Hatteras, northwest gales with rains followed by clearing weather. Hatteras to Florida Straits, strong northwest winds; fair weather. Storm of marked intensity central off New Jersey coast moving northeastward. Storm warnings displayed Hatteras to Eastport.

Translation of a small portion of the first part is as follows: United States Weather Bureau, St. Johns, barometer 30.16, wind direction, SW., wind force 2 (Beaufort scale). Each bulletin is invariably begun with the letters U.S.W.B. Each station has its code letter, as for instance, NY designates New York. The first three figures express the barometric pressure in inches reduced to sea level; the fourth figure is wind direction (1 = N., 2 = NE., 3 = E., etc.); the fifth and last figure is wind force in the Beaufort scale, except when winds of greater force than 9 occur when words instead of figures will be used.

Base charts (size 11½ by 14 inches) of the Atlantic coast extending to the 55th meridian, will be supplied free to vessel masters who regularly take and forward weather observations to the United States Weather Bureau, or to the Hydrographic Office, United States Navy; others may obtain them at a cost of 75 cents a hundred.

A similar service for the Pacific coast is in preparation and will be announced later.

The advantages to be derived from such a service are manifold. While it is primarily intended for coast use, shipping and the like, it would seem that the fruit grower, the cotton grower, and in fact any large business whose following days' work is largely dependent upon the weather would find this service invaluable. Wireless apparatus has been developed to such a state that for less than $10 a simple outfit may be obtained, which is sufficient to receive from the larger stations, if they are not too far away. At the greatest distance from a sending station in this country a $25 outfit would suffice. The writer has an outfit consisting of an aerial, detector, coil, and phones (cost $10) with which he is able to obtain not only Arlington, but many other stations. Arlington sends out comparatively slowly so that it is but a matter of a few weeks practice before one is able to receive well.—*I. F. H.*

LONG INDIVIDUAL METEOROLOGICAL RECORDS.

In a short article on page 413 of the MONTHLY WEATHER REVIEW for July, 1920, reporting the death of a veteran cooperative observer of the Weather Bureau, at the age of 103 years, the author says: "It is believed that this individual record for more than 66 years is unparalleled in this country, if not in the world."

In this connection I beg to call attention to the meteorological record kept by Mr. H. D. Gowey, at North Lewisburg, Ohio, from January, 1832, to June, 1909, a period of 77½ years.

Mr. Gowey began the observations when he was 13 years old, and continued them at practically the same location up to within a few days of his death at over 90 years of age.

The thermometer was read three times a day, and there is scarcely an observation missing during the whole period of time. The temperature observations were begun in 1832, and the rainfall record in 1852. We know of no other individual series of temperature observations of this length in existence.—*J. Warren Smith.*

THE GREAT SUN-SPOT GROUP AND THE MAGNETIC STORM, MARCH 22-23, 1920.

By the Rev. A. L. CORTIE, S. J.

[Abstracted from Monthly Notices Roy. Astr. Soc., 80: 574-578, 1920, April.]

A small spot appearing December 27, 1919, developed into a fine group which had almost died away at the third return February 17–26; revival took place on an immense scale at the next return March 16–29, the group being the greatest since 1917. The months of December, 1919, and January to February, 1920, were magnetically quiet, only a few days being much disturbed. Moderate disturbances accompanied the appearances of the group January 1 and 28, and a more severe storm on February 24; the March revival was accompanied by a magnetic storm of extreme violence March 22–23. All these disturbances appeared at 27-day intervals.

Cortie holds that the greater frequency of magnetic disturbances near the equinoxes is due to the fact that then the heliographic latitude of the earth is in the sun's semiequatorial plane, i. e., in the region of the sun spots; such a position is particularly favorable in the period after the maximum of a sun-spot cycle, when the mean latitude of the sun spots is falling toward the solar equator (*Cf.* M. N., **73:** 58, 1912; **76:** 16, 1915). In the present instance both these conditions were satisfied.

If we suppose that the requisite ionisation of the upper atmosphere is a gradual process as spots begin to grow in number and magnitude, then the advent of a specially active or large spot will suffice to bring about a great storm. In this case there had been a well-marked drop in the values of the monthly ranges of the magnetic elements since October, 1919, indicating that the ionisation of the upper atmosphere due to the successive presentments of the disturbed solar region in December and January was not sufficiently great to cause any but minor disturbances; the conditions were better in February and a moderate storm took place, but the climax was reached in March, when all the conditions—a great disturbed sun-spot region, a favorable heliographic position of the earth, and a highly charged condition of the upper atmosphere—were realized. Anyone of these conditions alone might be sufficient to cause a storm, and hence storms may appear without spots or very small spots; and vice versa, since a large spot need not necessarily be very active. (*Cf.* M. N., **73:** 155, 1913; Astrophys. Jour., **13:** 260, 1901; **49:** 20, 1919). See MONTHLY WEATHER REVIEW, July, 1920, **48:**379.—*E. W. W.*

INTERNAL FRICTION IN THE ATMOSPHERE.

By D. BRUNT.

[Abstracted from *Quar. Jour. Roy. Met'l Soc.*, April, 1920, 46, 175-185. Shorter abstract in *Nature* (London), Feb. 26, 1920, p. 714.]

The frictional force R acting upon unit volume of the atmosphere may be measured by the amount of horizontal momentum lost per unit of time; this internal friction is chiefly due to eddy viscosity, and according to Taylor the components of R along the axes of x and y are $K\rho d^2u/dz^2$ and $K\rho d^2v/dz^2$, respectively, $R = f(z)$. In the steady state, the forces acting on the air at any level, due to gradient, rotation, and internal friction, must be in equilibrium. Assuming (1), K to be constant throughout the height considered, (2) the gradient wind G to be constant or a linear function of the height z, and (3) the direction of slipping at the boundary to be in the direction of strain, these conditions lead to a vector equation whose solution shows that the wind V at any height is equivalent to G plus an added component $\sqrt{2}G \sin \alpha\, e^{-Bz}$ acting at an angle $\alpha + \frac{3\pi}{4} - Bz$ with the direction of G. This component decreases with height according to the exponential law, rotates its direction uniformly counter-clockwise with increasing height, and sweeps out the equiangular spiral previously treated by Hesselberg and Sverdrup, Ekman,